

REMARKS

The Applicants propose to amend certain claims as set forth above to overcome the Examiner's rejections and place the application in condition for allowance. The entry of this amendment under the provisions of Section 116 and the allowance of the pending claims is respectfully requested. Claims 1, 5-12, 14-18, and 20-26 and 28-31 remain in the application.

Within the first claim set (claims 1-14 and claims 27-31), claims 1, 5, 8, 9, 13 and 27-31 stand rejected under Section 103(a) under Katata (6,500,686) in view of Burkhart (6,377,060). Claims 6, 7, 10-12 and 14 stand rejected under Section 103(a) as unpatentable over Katata in view of Burkhart and further in view of the Applicant's admitted prior art.

To further distinguish the invention over the cited art, the Applicants have amended the second paragraph of independent claim 1 to "supporting the wafer in a spaced-apart relation from an upper surface of the chuck, wherein during deposition the wafer is held in position only by gravitational forces urging the wafer against the upper surface." The first and fourth paragraphs have been amended to refer to aluminum material to be deposited. Support for the claim 1 amendments can be found in the specification in Figures 5 and 6 and the accompanying text in paragraphs [0027] and [0028].

Katata discloses a chuck electrode divided into at least two portions (an inner and an outer circumferential electrode portion) with the chuck voltage applied successively from the inner electrode portion to the outer electrode portion. This technique avoids the prior art problem as Katata explains, "[w]hen the wafer is 103 of room temperature is disposed and chucked on the hot plate having a high temperature, the wafer 103 is thermally expanded in accordance with the temperature elevation. However, since the wafer 103 is fixed to the entire surface of the plate body 100 by the electrostatic chucking force, the wafer 103 fails to be expanded sufficiently . . . with the result that the wafer 103 is finally cracked by the compression stress." In all of his various embodiments, Katata describes only an electrostatic chuck for urging the wafer against the chuck by electrostatic attraction forces, which is contrary to the Applicant's claim language of "supporting the

wafer in a spaced-apart relation from an upper surface of a chuck, wherein during deposition the wafer is held in position only by gravitational forces acting on the wafer.”

Burkhart discloses capacitance measuring techniques for determining the presence and the position of the wafer on the wafer support pedestal. In conjunction with the various embodiments disclosed, Burkhart discloses only electrostatically chucking of the wafer to the support pedestal. See Burkhart's Figure 1 and the related text beginning at line 6 of column 4, wherein he describes the invention in the context of an electrostatic chuck 101. In lines 37-40 of column 4, Burkhart adds that the invention “is also useful for wafer detection above any form of chuck, including ceramic electrostatic chucks, mechanical chucks, vacuum chucks and the like at any temperature.”

Thus neither Burkhart nor Katata disclose “supporting the wafer in a spaced-apart relation from an upper surface of a chuck, wherein during deposition the wafer is held in position only by gravitational forces urging the wafer against the upper surface.”

In his Background section, Katata describes the known techniques for attaching the wafer to the hot plate within the chuck, “the wafer is tightly attached to the hot plate by utilizing evacuation on the back surface of the wafer so as to fix the wafer, the method that the wafer is electrically fixed by using the electrostatic attraction force, and the method that the wafer is mechanically pushed against the hot plate by utilizing a clamp or the like for fixing the wafer.” The Applicants' invention is a significant departure from these techniques since the Applicants teach that the wafer can be supported only by gravitational forces acting on the wafer during the deposition process.

It is further noted that the Examiner refers to the grain orientation of silicon oxide in the rejection of claim 1. In fact, silicon oxide used in semiconductor technology is an amorphous material that does not exhibit a granular structure.

Further, during the Applicant's step of depositing material from the target onto the wafer “the wafer temperature is controlled by the chuck temperature.” According to the third paragraph of amended claim 1, the chuck temperature is controlled during deposition. Katata discusses the wafer heating and electrostatic chucking effects only when the wafer enters the chamber. The Examiner's refers to Katata's column 9 text, but here Katata describes wafer heating immediately after the wafer enters the chamber, not during the

deposition process as the Applicants claim. Katata does not appreciate nor discuss the heating/cooling effects that occur in the chamber during the deposition process as the Applicants discuss at paragraph [0015] and claim in the fourth paragraph of claim 1, i.e., "depositing material from the target onto the wafer during which the wafer temperature is controlled by the chuck temperature . . ." Since Katata fails to recognize this problem addressed by the Applicants, his disclosure cannot suggest the Applicant's solution.

With regard to the amendment to claim 1 referring to aluminum material as the deposited material, only the Applicants have recognized that a combination of the steps of controlling the chuck temperature to control the wafer temperature by radiant heat flow from the chuck to the wafer, with the wafer supported on the upper surface of the chuck only by gravitational forces, results in the deposition of aluminum with a desired grain orientation. Although in his rejection of claim 6 (which refers to the deposition of aluminum or an aluminum alloy), the Examiner suggests that the combination of Katata, Burkhart and the reference to material sputtering in the Applicant's paragraph [0015] discloses the features of claim 6, this conclusion is reached only by hindsight application of the Applicants' invention to the cited art. The mere mention of sputtering and the desirability of a certain aluminum grain orientation by the Applicants does not permit the combination of Katata and Burkhart to reach the Applicants' invention as set forth in amended claim 1, in which aluminum with a desired grain orientation is deposited.

Each of the dependent claims 5-12, 14 and 26-31 include claim elements of the present invention that further distinguish over the art of record and therefore are deemed to be in condition for allowance. Claims 6, 10, 11, 28 and 29 have been amended to comport with the amendments to claim 1 from which they depend.

Claims 13 and 27 have been cancelled, without prejudice. The Applicants reserve the right to prosecute these claims or similar claims in a continuing application. The cancellation of claims 13 and 27 is not to be construed as an admission as to the validity of the rejection or the relevance of the cited art.

Within the second claim set, independent claim 15 and dependent claims 16-18 and 20-26 are rejected under Katata in view of Burkhart further in view of the Applicant's admitted prior art.

To further distinguish the invention over the cited art, the Applicants have amended the second paragraph of independent claim 15 to "a chuck for supporting the wafer, wherein while depositing material on the wafer the wafer is urged against an upper surface of the chuck solely by gravitational forces exerted by the wafer against the chuck." Support for the amendments to claim 15 can be found in the specification in Figures 5 and 6 and the accompanying text in paragraphs [0027] and [0028].

Katata discloses an electrostatic chuck and therefore cannot disclose that when depositing material on the wafer, the wafer is "urged against an upper surface of the chuck solely by gravitational forces exerted by the wafer against the chuck" Burkhardt too discloses only electrostatically chucking of the wafer to the chuck during deposition. The combination cannot disclose a physical deposition chamber if neither reference discloses a deposition chamber as claimed. The reference to aluminum material in amended claim 15 further distinguishes the cited references.

Each of the dependent claims 16-18 and 20-26 claim elements of the present invention that further distinguish the invention over the art of record and therefore are deemed to be in condition for allowance. The Examiner's allowance of these pending claims is earnestly solicited. Claim 19 was previously cancelled. Claims 21, 25 and 26 have been amended as indicated above for consistency with the amendments to claim 15 from which they depend.

Since the proposed claim amendments overcome the current claim rejections, entry of the amendments and issuance of a Notice of Allowance for all pending claims is respectfully requested.

If a telephone conference will assist in clarifying or expediting this Amendment, the Examiner is invited to contact the undersigned at the telephone number below.

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